



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



Publication number: **0 270 598 B1**

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **01.09.93** (51) Int. Cl.<sup>5</sup>: **H01R 13/658, H01R 23/70**

(21) Application number: **87903484.1**

(22) Date of filing: **06.04.87**

(86) International application number:  
**PCT/US87/00741**

(87) International publication number:  
**WO 87/07444 (03.12.87 87/27)**

(54) **SHIELDED ELECTRICAL CONNECTOR.**

(30) Priority: **30.05.86 JP 125599/86**

(43) Date of publication of application:  
**15.06.88 Bulletin 88/24**

(45) Publication of the grant of the patent:  
**01.09.93 Bulletin 93/35**

(84) Designated Contracting States:  
**DE FR GB IT NL**

(56) References cited:  
**GB-A- 2 027 290**

(73) Proprietor: **THE WHITAKER CORPORATION**  
**Suite 450, 4550 New Linden Hill Road**  
**Wilmington, Delaware 19808(US)**

Proprietor: **NEC CORPORATION**  
**7-1, Shiba 5-chome Minato-ku**  
**Tokyo 108-01(JP)**

(72) Inventor: **MANABE, Sakae**  
**Tama-ku Kawasaki-shi**  
**Kanagawa-ken(JP)**

Inventor: **KAMONO, Takashi**  
**Shinohara-cho Kohoku-ku**  
**Yokohama-shi Kanagawa-ken(JP)**  
Inventor: **TOKAICHI, Tetsuro**  
**NEC Corporation 5-33-1, Shiba**  
**Minato-ku Tokyo(JP)**  
Inventor: **UMESATO, Shoji**  
**NEC Corporation 5-33-1, Shiba**  
**Minato-ku Tokyo(JP)**

(74) Representative: **Warren, Keith Stanley et al**  
**BARON & WARREN 18 South End Kensington**  
**London W8 5BU (GB)**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

EP 0 270 598 B1

## Description

This invention relates to an electrical connector and more particularly to a shielded electrical connector that has a shield plate disposed along exposed terminal sections of electrical contact members that extend outwardly from a housing.

Electrical connectors with a large number of electrical contacts are often used in electrical computers, particularly large computers which produce a high number of transmission signals. One example of a known connector will be described with reference to Figure 7. This connector comprises a first connector 1 which holds many plug contacts 2 in a receptacle housing 3, and a second connector 5 which also has many receptacle contacts 8 held within plug housing 6. Plug contacts 2 in the first connector 1, are disposed in multiple rows in receptacle housing 3, each row containing plug contacts 2 arrayed laterally. The plug housing 6 in the second connector 5 has multiple rows of receptacle contacts 8, corresponding to the array of plug contacts 2. When plug housing 6 is mated with receptacle housing 3, the plug contacts 2 electrically mate with corresponding receptacle contacts 8. The other end of the receptacle contacts 8 are exposed and protrude from the back of plug housing 6 and are bent downward as shown in Figure 7 as multiple rows of terminal sections 8a which are maintained in parallel rows by the retaining plate 7.

Use of this type of connector permits a high number of transmission signals using a small connector. However, because the exposed sections of the receptacle contacts 8 in the second connector 5 protrude externally from the plug housing 6, and further because the spacing between the receptacle contacts 8 has been reduced in response to a requirement to increase the number of transmission signals, crosstalk is generated between the adjoining contacts thereby resulting in the possibility of noise faults occurring. The chances of crosstalk being generated and thus the risk of noise faults, increase with the higher transmission signal speeds made possible by the larger capacity and better performance of computers.

GB-A-2027290 describes a multi-row plug connector for transmitting small signals with low cross-talk in a data processing system. The plug comprises a pin strip having rows of pins secured therein and an electrically conductive shield plate resiliently held between a row of signal pins and an adjacent row of reference potential pins. The shield plate is electrically connected to the reference potential pins and an electrically insulating foil is arranged electrically to insulate the signal pins from the shield plate.

It is an object of the present invention to provide a shielded electrical connector which prevents the generation of cross-talk and alleviates the risk of noise faults occurring.

The invention consists in a shielded electrical connector comprising a dielectric housing having rows of electrical contact members secured therein, each of said contact members having a contact section at a front end for connection with a mating contact and a terminal section extending from a rear surface of the housing for connection to a printed circuit board, and a shield plate disposed along at least one of the rows of terminal sections, said shield plate being coated on the exterior with an insulation layer, characterized in that the shield plate has terminals at one end thereof connected to foreshortened terminal sections of ground contact members secured in the housing and terminal members at the opposite end thereof for electrical connection to a ground path of the printed circuit board.

A connector constructed in the manner described above prevents the occurrence of noise by intercepting the cross-talk between the rows of contact members using the grounded shield plate positioned between the exposed terminal sections of the contact members which protrude from the housing.

An embodiment according to the present invention will be described by way of example with reference to the accompanying drawings, in which:-

Figure 1 is an exploded perspective view of the multiple shielded connector according to the present invention showing only the second row of contact members.

Figure 2 is a side view partly in cross-section of the shielded connector according to the invention.

Figure 3 is a part side view partly in cross-section showing an enlargement of the attachment of the shield plate to the ground tabs of the contact members of the connector.

Figure 4 is a part perspective view of an alternative shield plate.

FIGURES 5 and 6 are part cross-sectional views of the shield plate attached to the ground tabs, taken in the directions indicated in Figure 4 by the lines V-V and VI-VI.

FIGURE 7 is a perspective exploded view of conventional matable electrical connector.

Figure 1 shows shielded connector SC of this invention in which only the second row of electrical contact members 22 are shown. Shield 30 as shown in Figure 2 extends along the upper surfaces of the second row of contact members 22. The dielectric housing 10 includes a plurality of contact passages (not shown) arranged in rows and opening at the front surface, indicated by the direc-

tion of arrow A, and contact sections (not shown) of the contact members 22 are accommodated in the contact passages.

In addition, many small holes 11 in multiple rows as part of the above contact passages extend through the rear surface of housing 10. The terminal sections 22b of the contact members 22 protrude through the small holes 11 at the rear surface of housing 10 in a slanted manner downwards and backwards, and are bent downwards in the middle so as to be substantially parallel to the rear surface of housing 10 for electrical connection with signal paths on a printed circuit board (not shown). However, some of the contact members 22 are grounding terminal sections so that the contact sections thereof are electrically connected to mating ground electrical contacts, and they are cut short as indicated in Figure 1 forming ground tabs 22a extending outwardly from the rear surface of housing 10 in the same angular direction as that of terminal sections 22b as well as being in alignment therewith.

Shield plate 30 comprises a metal plate which is bent to the shape of the terminal sections 22b and which has its surfaces coated with an insulating material, such as polyimide. The upper end of shield plate 30 includes pairs of first ground terminals 31a and second ground terminals 31b, in alignment with the ground tabs 22a. The bottom end of shield plate 30 has third ground terminals 32 which protrude downwards and are in alignment with the respective pairs of ground terminals 31a and 31b. First ground terminals 31a and second ground terminals 31b are bifurcated.

When the shield plate 30 is placed on top of terminal sections 22b of the second row of contact members 22, the respective ground tabs 22a are disposed between bifurcated ground terminals 31a, 31b, and the ground terminals 32 are aligned with the terminal sections 22b. Ground terminals 32 are used in place of the missing terminal sections of the shortened ground tabs 22a. The ground terminals 31a, 31b and the ground terminals 32 of the shield plate 30 are not coated with insulating material.

When the shield plate 30 is mounted on the terminal sections 22b of the second row of contact members 22, and the ground tabs 22a are fitted between the first and second ground terminals 31a and 31b are soldered together, the ground tabs 22a are electrically connected with the shield plate 30. Therefore, the shield plate 30 can be grounded by connecting the ground terminals 32 to the ground path or paths of a printed circuit board (not shown), and thus crosstalk between adjacent rows of the contact members can be prevented. Also, crosstalk between adjacent contact members in each row is eliminated by grounding several contact members

as shown in Figure 1.

The above describes the mounting of a shield plate on the second row of contact members of an electrical connector. Figure 2 shows the connector having shield plates mounted in a similar manner on two rows of the contact members. The connector has six rows of contact members 21-26 in the housing 10. The terminal sections 21b-26b of each row of contact members 21-26 extend downwards and are held in place by a dielectric retaining plate 15 which prevents displacement of the terminal sections. In the connector, the shield plates 30 and 40 are respectively mounted on the upper surfaces of the second row of contact members 22 and the third row of contact members 23. The upper ends of shield plates 30, 40 are electrically connected to ground tabs while ground terminals 32, 42 are electrically connected to ground paths on the printed circuit board. The shield plates 30 and 40 prevent crosstalk being generated between the first and second rows of contact members 21, 22 and the second and third rows of contact members 22, 23 respectively.

Figure 3 shows ground tab 22a disposed between the bifurcated first and second ground terminals 31a and 31b at the upper end of shield plate 30 with ground tab 22a being soldered in place. The surface of shield plate 30 is coated with an insulating material 30a such as polyimide except for the first and second ground terminals 31a and 31b and the ground leg 32. Shield plate 40 is also connected in the same manner as shield plate 30.

Figure 4 shows a perspective view of another embodiment of a connection between shield plate 30 and ground tab 22a. In this embodiment T-shaped cuts are made in the upper end of shield plate 30 forming sections 33a, 33b which are then bent downwardly as shown in Figure 5 to form arcuate ground terminal sections 33a, 33b. When ground tab 22a is positioned between ground terminal sections 33a, 33b and soldered thereto by solder 50, the connection is shown in Figures 5 and 6 respectively. Therefore, the insulating coating 30a on the surface of the shield plate 30 does not cover the surfaces of ground terminal sections 33a, 33b to be soldered to ground tabs 22a. Thus, as shown by Figure 6, the upper surface of solder 50 should be covered with insulation tape 55. The above-described embodiments disclose the positioning of a shield plate on the upper surfaces of a row of terminal sections of electrical contact members, however other ways to position shield plates on electrical contact members are possible.

As disclosed above, this invention is such that crosstalk generated between rows of terminal sections of contact members prevent the occurrence of noise faults, through the use of a grounded shield plate which is positioned between rows of

terminal sections arrayed in rows and protruding externally from their housing.

#### Claims

1. A shielded electrical connector comprising a dielectric housing (10) having rows of electrical contact members (21-26) secured therein, each of said contact members having a contact section at a front end for connection with a mating contact and a terminal section (21b-26b) extending from a rear surface of the housing for connection to a printed circuit board, and a shield plate (30,40) disposed along at least one of the rows of terminal sections (22b,23b), said shield plate (30,40) being coated on the exterior with an insulation layer (30a), characterized in that the shield plate has terminals (31a,31b;33a,33b) at one end thereof connected to foreshortened terminal sections (22a,23a) of ground contact members secured in the housing and terminal members (32,42) at the opposite end thereof for electrical connection to a ground path of the printed circuit board.
2. A shielded electrical connector as claimed in claim 1, characterized in that the terminals (31a,31b) are bifurcated between which the foreshortened terminal sections (22a,23a) are disposed.
3. A shielded electrical connector as claimed in claim 1, characterized in that the terminals (33a,33b) comprise opposed arcuate terminals between which the foreshortened terminal sections (22a,23a) are disposed.
4. A shielded electrical connector as claimed in claim 1, 2 or 3, characterized in that the terminals (31a,31b;33a,33b) are aligned with the terminal members (32,42).
5. A shielded electrical connector as claimed in any preceding claim, characterized in that the terminal sections (21b-26b) and the terminal members (32,42) are disposed in a retaining plate (15) holding them in place.

#### Patentansprüche

1. Abgeschirmter elektrischer Verbinder mit einem dielektrischen Gehäuse (10), das darin befestigte Reihen elektrischer Kontaktglieder (21 bis 26) hat, von denen jedes einen Kontaktabschnitt an einem vorderen Ende zur Verbindung mit einem passenden Kontakt sowie einen Anschlußabschnitt (21b bis 26b) hat, der

sich von einer hinteren Oberfläche des Gehäuses zur Verbindung mit einer gedruckten Schaltungsplatte erstreckt, und wobei eine Abschirmplatte (30, 40) längs wenigstens einer der Reihen der Anschlußabschnitte (22b, 23b) angeordnet ist, wobei die Abschirmplatte (30, 40) auf der Außenseite mit einer Isolations-schicht (30a) versehen ist, dadurch **gekennzeichnet**, daß die Abschirmplatte Anschlüsse (31a, 31b; 33a, 33b) an ihrem einen Ende hat, die mit gekürzten Anschlußabschnitten (22a, 23a) von Erdkontaktgliedern verbunden sind, die in dem Gehäuse befestigt sind, und daß die Abschirmplatte an ihrem entgegengesetzten Ende Anschlußglieder (32, 42) zur elektrischen Verbindung mit einer Erdleiterbahn der gedruckten Schaltungsplatte hat.

2. Abgeschirmter elektrischer Verbinder nach Anspruch 1, dadurch **gekennzeichnet**, daß die Anschlüsse (31a, 31b) gegabelt sind und daß dazwischen die gekürzten Anschlußabschnitte (22a, 23a) angeordnet sind.
3. Abgeschirmter elektrischer Verbinder nach Anspruch 1, dadurch **gekennzeichnet**, daß die Anschlüsse (33a, 33b) entgegengesetzte gekrümmte Anschlüsse aufweisen, zwischen denen die gekürzten Anschlußabschnitte (22a, 23a) angeordnet sind.
4. Abgeschirmter elektrischer Verbinder nach Anspruch 1, 2 oder 3, dadurch **gekennzeichnet**, daß die Anschlüsse (31a, 31b; 33a, 33b) mit den Anschlußgliedern (32, 42) ausgerichtet sind.
5. Abgeschirmter elektrischer Verbinder nach einem der vorhergehenden Ansprüche, dadurch **gekennzeichnet**, daß die Anschlußabschnitte (21b bis 26b) und die Anschlußglieder (32, 42) in einer Halteplatte (15) angeordnet sind, die sie an Ort und Stelle hält.

#### Revendications

1. Connecteur électrique blindé comportant un boîtier diélectrique (10) dans lequel sont fixées des rangées d'éléments de contact électriques (21-26), chacun desdits éléments de contact ayant une section de contact à une extrémité avant pour une connexion avec un contact complémentaire, et une section terminale (21b-26b) sortant d'une surface arrière du boîtier pour une connexion sur une plaquette à circuit imprimé, et une plaque de blindage (30, 40) disposée le long d'au moins l'une des rangées de sections terminales (22b, 23b), ladite pla-

que de blindage (30, 40) étant revêtue, sur l'extérieur, d'une couche isolante (30a), caractérisé en ce que la plaque de blindage comporte des bornes (31a, 31b ; 33a, 33b), à l'une de ses extrémités, connectées à des sections terminales raccourcies (22a, 23a) d'éléments de contact de masse fixées dans le boîtier, et des éléments terminaux (32, 42), à son extrémité opposée, pour une connexion électrique sur une piste de masse de la plaquette à circuit imprimé.

2. Connecteur électrique blindé selon la revendication 1, caractérisé en ce que les bornes (31a, 31b) sont fourchues, les sections terminales raccourcies (22a, 23a) étant disposées entre elles.
3. Connecteur électrique blindé selon la revendication 1, caractérisé en ce que les bornes (33a, 33b) comprennent des bornes incurvées opposées entre lesquelles les sections terminales raccourcies (22a, 23a) sont disposées.
4. Connecteur électrique blindé selon la revendication 1, 2 ou 3, caractérisé en ce que les bornes (31a, 31b ; 33a, 33b) sont alignées avec les éléments terminaux (32, 42).
5. Connecteur électrique blindé selon l'une quelconque des revendications précédentes, caractérisé en ce que les sections terminales (21b-26b) et les éléments terminaux (32, 42) sont disposés dans une plaque de retenue (15) les maintenant en place.

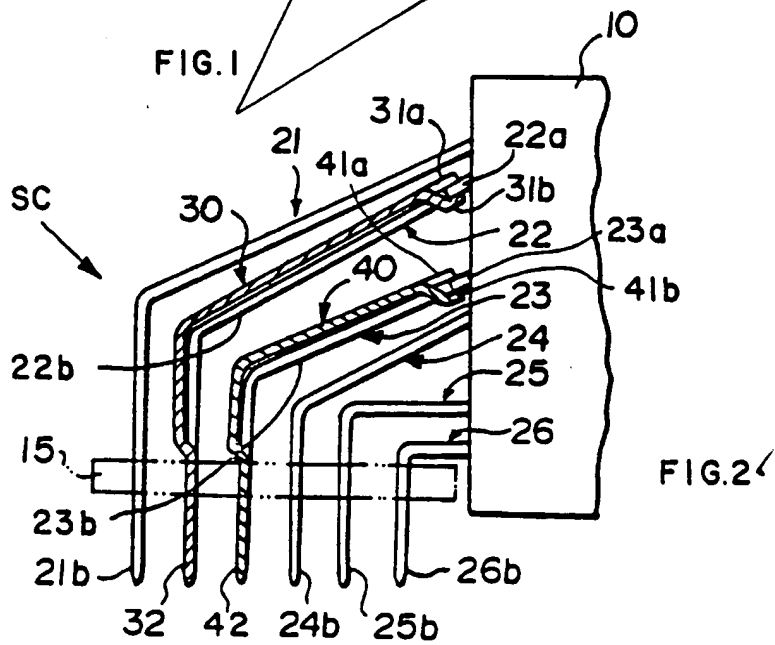
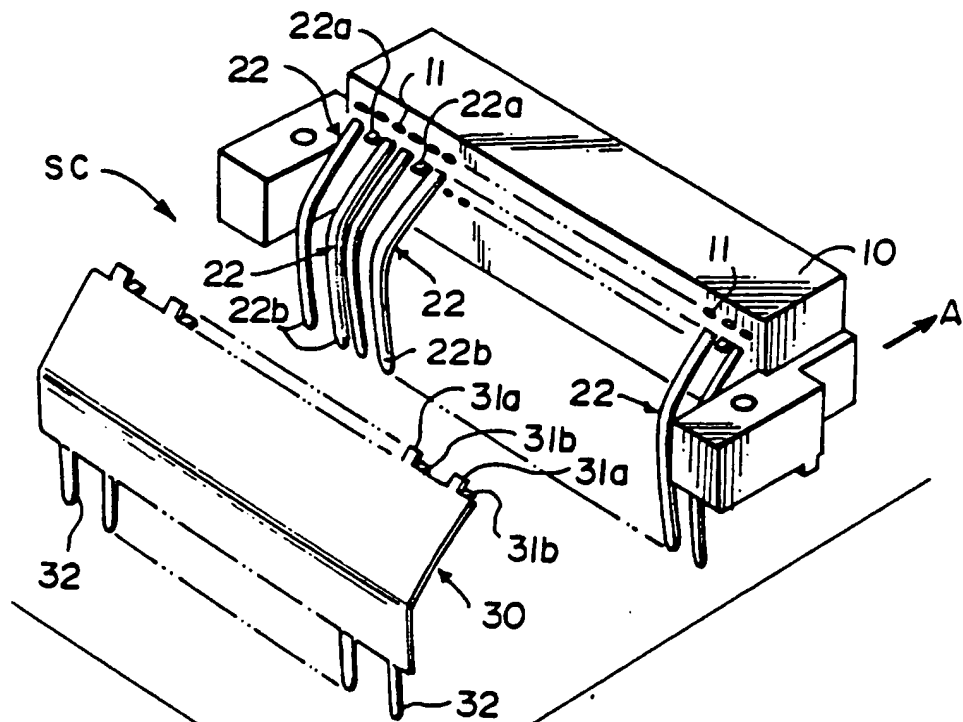
40

45

50

55

5



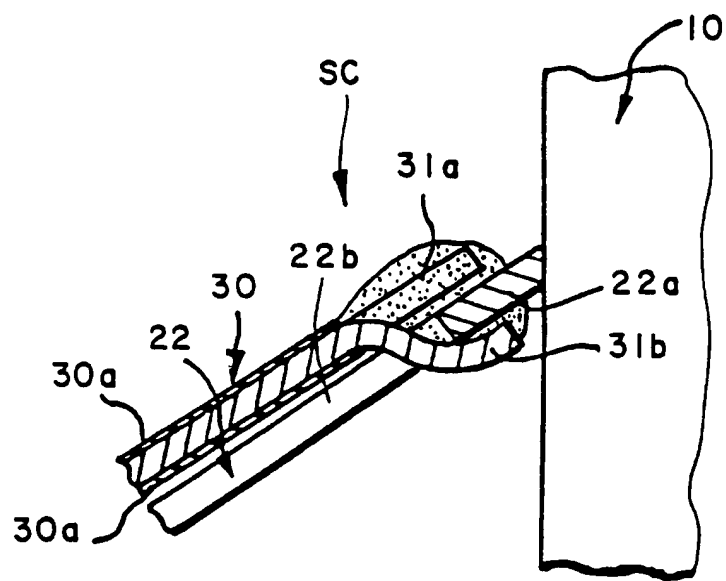


FIG. 3

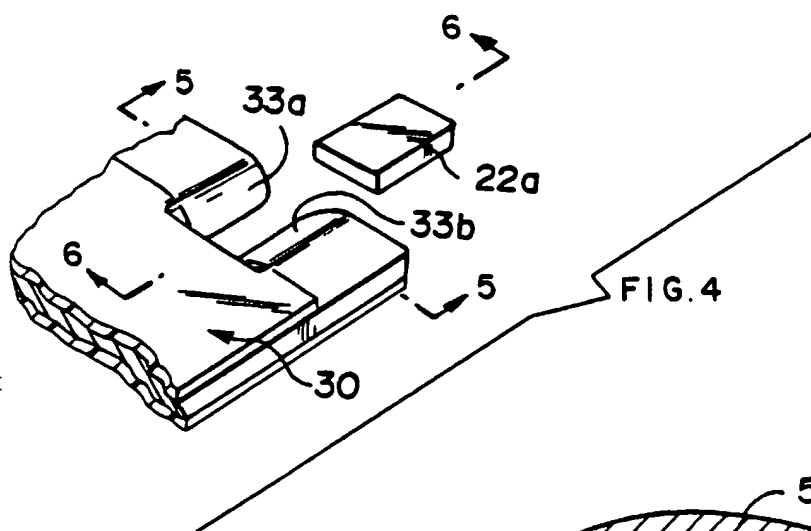


FIG. 4

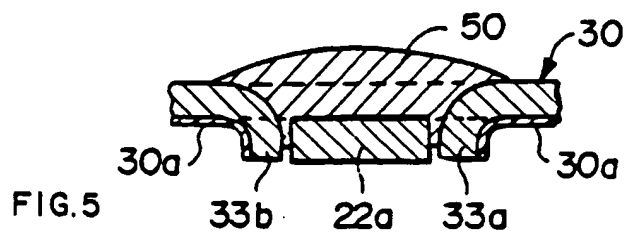


FIG. 5

